Claims:

1   1.   A method of performing an incision on a skin surface using a computer aided

2   surgical navigation system, the system comprising: a sensor adapted to sense the

3   position and orientation of at least one surgical reference associated with a structure

4   to be referenced; and computer functionality adapted to receive information from the

5   sensor about position and orientation of the surgical reference and generate

6   information corresponding to the position and orientation of the structure to be

7   referenced to which the surgical reference is associated, the method of guiding the

8   surgical incision comprising:

9   (a)   associating at least one first surgical reference with a portion of an

10   individual's bony anatomy and skin proximate the bony anatomy;

11   (b)   registering the position and orientation of the portion of the individual's

12   bony anatomy and skin proximate the bony anatomy with the computer aided

13   surgical navigation system such that the computer functionality can generate

14   information corresponding to the position and orientation of the individual's bony

15   anatomy and skin proximate the bony anatomy by receiving information from the

16   sensor sensing the position and orientation of the first surgical reference;

17   (c)   calculating a suggested incision path and length based upon the

18   information generated by the computer functionality corresponding to the position

19   and orientation of the individual's bony anatomy and skin proximate the bony

20   anatomy;

21   (d)   associating at least one second surgical reference with an incision

22   device, wherein the incision device is a cutting device or a marking device;

23   (e)   registering the position of the incision device with the computer aided

24   surgical navigation system such that the computer functionality can generate

25   information corresponding to the position of the incision device by receiving

26   information from the sensor sensing the position and orientation of the second

27   surgical reference; and

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28   (f)   using the incision device in the performance of the incision, wherein the

29   computer aided surgical navigation system provides guidance based on comparing

30   the suggested incision path and length with the information corresponding to the

31   position and orientation of the incision device as generated by the computer

32   functionality by receiving information from the sensor sensing the position and

33   orientation of the second surgical reference.

1   2.   The method of performing an incision on a skin surface using a computer

2   aided surgical navigation system of Claim 1, wherein the computer aided surgical

3   navigation system providing guidance further comprises a display associated with

4   the computer aided surgical navigation system displaying the suggested incision

5   path and length and the position of the incision device.

1   3.   The method of performing an incision on a skin surface using a computer

2   aided surgical navigation system of Claim 2, wherein displaying the suggested

3   incision path and length and the position of the incision device further comprises a

4   semi-transparent display displaying the suggested incision path and length and the

5   position of the of the incision device or a monitor displaying the suggested incision

6   path and length and the position of the of the incision device.

1   4.   The method of performing an incision on a skin surface using a computer

2   aided surgical navigation system of Claim 1, further comprising providing feedback if

3   the incision device deviates from the suggested incision.

1   5.   The method of performing an incision on a skin surface using a computer

2   aided surgical navigation system of Claim 4, wherein providing feedback comprises

3   providing a visible warning if the incision deviates from the suggested incision.

1   6.   The method of performing an incision on a skin surface using a computer

2   aided surgical navigation system of Claim 5, wherein providing a visible warning if

3   the incision deviates from the suggested incision comprises displaying a comparison

4   of the suggested incision path and length with at least a portion of a path traveled by

5   the incision device.

1   7.   The method of performing an incision on a skin surface using a computer

2   aided surgical navigation system of Claim 5, further comprising projecting an image

3   of the suggested incision onto the individual; and wherein providing a visible warning

4   if the incision deviates from the suggested incision comprises altering the image if

5   the incision deviates from the suggested incision.

1   8.   The method of performing an incision on a skin surface using a computer

2   aided surgical navigation system of Claim 4, wherein providing feedback further

3   comprises providing an audible warning if the incision deviates from the suggested

4   incision path.

1   9.   The method of performing an incision on a skin surface using a computer

2   aided surgical navigation system of Claim 1, further comprising: using the incision to

3   access the interior of the individual to install an orthopaedic implant; and installing

4   the orthopaedic implant.

1   10.   A system for guiding an incision on a skin surface, comprising:

2   (a)   a computer aided surgical navigation system, comprising:

3   (i)   a sensor adapted to sense the position and orientation of at least

4   one surgical reference associated with a structure to be referenced; and

5   (ii)   computer functionality adapted to receive information from the

6   sensor about position and orientation of the surgical reference and generate

7   information corresponding to the position and orientation of the structure to be

8   referenced to which the surgical reference is associated;

9   (b)   at least one first surgical reference adapted to be associated with a

10 portion of an individual's bony anatomy and skin proximate the bony anatomy such

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11   that the position and orientation of the portion of the individual's bony anatomy and

12   skin proximate the bony anatomy can be registered with the computer aided surgical

13   navigation system, the computer functionality adapted to generate information

14   corresponding to the position and orientation of the individual's bony anatomy and

15   skin proximate the bony anatomy by receiving information from the sensor sensing

16   the position and orientation of the first surgical reference, the computer functionality

17   adapted to calculate a suggested incision path and length on the skin proximate the

18   bony anatomy based upon the information generated by the computer functionality

19   corresponding to the position and orientation of the individual's bony anatomy;

20   (c)   at least one second surgical reference adapted to be associated with

21   an incision device, wherein the incision device is a cutting device or a marking

22   device, the at least one second surgical reference adapted to be registered with the

23   computer aided surgical navigation system, the computer functionality adapted to

24   generate information corresponding to the position of the incision device by

25   receiving information from the sensor sensing the position and orientation of the

26   second surgical reference; and

27   (d)   wherein the computer aided surgical navigation system is adapted to

28   compare the suggested incision path and length with the information corresponding

29   to the position of the incision device.

1   11.   The system for guiding an incision on a skin surface of Claim 10, further

2   comprising a display, the display adapted to compare the suggested incision path

3   and length with the information concerning the position of the incision device by

4   displaying the suggested incision path and length and the position of the incision

5   device.

1   12.   The system for guiding an incision on a skin surface of Claim 11, wherein the

2   display comprises a semi-transparent display or a monitor.

1   13.   The system for guiding an incision on a skin surface of Claim 12, wherein the
2   display comprises a semi-transparent display, the semi-transparent display
3   associated with at least one third surgical reference, the at least one third surgical
4   reference adapted to be registered with the computer aided surgical navigation
5   system, the computer functionality adapted to generate information corresponding to
6   the position and orientation of the semi-transparent display by receiving information
7   from the sensor sensing the position and orientation of the third surgical reference.

1   14.   The system for guiding an incision on a skin surface of Claim 10, wherein the
2   computer aided surgical navigation system further comprises feedback functionality
3   adapted to provide feedback if the incision device deviates from the suggested
4   incision path.

1   15.   The system for guiding an incision on a skin surface of Claim 14, wherein the
2   feedback functionality is adapted to provide visual feedback if the incision device
3   deviates from the suggested incision path.

1   16.   The system for guiding an incision on a skin surface of Claim 15, wherein the
2   feedback functionality comprises a display adapted to display the suggested incision
3   and a path traveled by the incision device.

1   17.   The system for guiding an incision on a skin surface of Claim 15, further
2   comprising a projector, the projector: adapted to project an image of the suggested
3   incision path onto the individual; and adapted to provide visual feedback if the
4   incision device deviates from the suggested incision path by altering the image if the
5   incision device deviates from the suggested incision path.

1   18.   The system for guiding an incision on a skin surface of Claim 15, wherein the
2   feedback functionality is adapted to provide audible feedback if the incision device
3   deviates from the suggested incision path.

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1   19. . A system for guiding an incision on a skin surface, comprising:

2   (a)   a computer aided surgical navigation system, comprising:

3   (i)   a sensor adapted to sense the position and orientation of at least

4   one surgical reference associated with a structure to be referenced; and

5   (ii)   computer functionality adapted to receive information from the

6   sensor about position and orientation of the surgical reference and generate

7   information corresponding to the position and orientation of the structure to be

8   referenced to which the surgical reference is associated;

9   (b)   at least one first surgical reference adapted to be associated with a

10   portion of an individual's bony anatomy and skin proximate the bony anatomy such

11   that the position and orientation of the portion of the individual's bony anatomy and

12   skin proximate the bony anatomy can be registered with the computer functionality,

13   the computer functionality adapted to generate information corresponding to the

14   position and orientation of the individual's bony anatomy and skin proximate the

15   bony anatomy by receiving information from the sensor sensing the position and

16   orientation of the first surgical reference, the computer functionality adapted to

17   calculate a suggested incision path and length based upon the information

18   generated by the computer functionality corresponding to the position and

19   orientation of the individual's bony anatomy and skin proximate the bony anatomy;

20   (c)   at least one second surgical reference adapted to be associated with

21   an incision device, wherein the incision device is a cutting device or a marking

22   device, the at least one second surgical reference and the incision device adapted to

23   be registered with the computer aided surgical navigation system, the computer

24   functionality adapted to generate information corresponding to the position of the

25   incision device by receiving information from the sensor sensing the position and

26   orientation of the second surgical reference;

27   (d)   wherein the computer aided surgical navigation system is adapted to

28   compare the suggested incision with the information corresponding to the position of

29   the incision device; and

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30   (e)   wherein the computer aided surgical navigation system further
31   comprises feedback functionality adapted to provide feedback if the incision device
32   deviates from the suggested incision.

1   20.   The system for guiding an incision on a skin surface of Claim 19, further
2   comprising a projector, the projector adapted to project an image of the suggested
3   incision path onto the individual and adapted to provide visual feedback by altering
4   the image if the incision device deviates from the suggested incision path.

1   21.   The system for guiding an incision on a skin surface of Claim 19, further
2   comprising a display, the display adapted to display an image of the suggested
3   incision path and display at least a portion of a path followed by the incision device.

1   22.   A system for guiding an incision on a skin surface, comprising:
2   (a)   a computer aided surgical navigation system, comprising:
3   (i)   a sensor adapted to sense the position and orientation of at least
4   one surgical reference associated with a structure to be referenced; and
5   (ii)   computer functionality adapted to receive information from the
6   sensor about position and orientation of the surgical reference and generate
7   information corresponding to the position and orientation of the structure to be
8   referenced to which the surgical reference is associated;
9   (b)   at least one first surgical reference adapted to be associated with a
10   portion of an individual's bony anatomy and skin proximate the bony anatomy such
11   that the position and orientation of the portion of the individual's bony anatomy and
12   skin proximate the bony anatomy can be registered with the computer functionality ,
13   the computer functionality adapted to generate information corresponding to the
14   position and orientation of the individual's bony anatomy and skin proximate the
15   bony anatomy by receiving information from the sensor sensing the position and
16   orientation of the first surgical reference, the computer functionality adapted to
17   calculate a suggested incision path and length based upon the information

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18   generated by the computer functionality corresponding to the position and

19   orientation of the individual's bony anatomy and skin proximate the bony anatomy;

20   (c)   at least one second surgical reference adapted to be associated with

21   an indicator device, the at least one second surgical reference and indicator device

22   adapted to be registered with the computer aided surgical navigation system, the

23   computer functionality adapted to generate information corresponding to the position

24   of the indicator device by receiving information from the sensor sensing the position

25   and orientation of the second surgical reference; and

26   (d)   wherein the computer aided surgical navigation system assists the

27   indicator device in outputting the suggested incision path and length onto the skin

28   surface based upon the information corresponding to the position of the indicator

29   device and the information corresponding to the position and orientation of the

30   individual's bony anatomy and skin proximate the bony anatomy.

1   23.   The system for guiding an incision on a skin surface of Claim 22, wherein the

2   indicator device comprises a marking device.

1   24.   The system for guiding an incision on a skin surface of Claim 22, wherein the

2   indicator device comprises a projector adapted to project an image of the suggested

3   incision path onto the individual.